ACE

MIND STRETCHERS

An exclusive collection of computer-related puzzles

- Cross-words
- Trivia quizzes
- Logic teasers
- Word-searches
- Number puzzles
- Micro-stretchers

With compliments of Advanced Computer Entertainment

MIND STRETCHERS

Welcome to this ACE puzzle book, given away free with our May Issue. Inside you will find:

- **TEN micro-stretchers to tease your brain and torment your computer**
- **TWO fiendish logic puzzles**
- **SEVEN baffling word and number-puzzles**
- **THREE trivia quizzes to test your computer knowledge**

PROGRAMMERS PLEASE NOTE.

The puzzles in the first section, MICRO-STRETCHERS, are best solved by writing a simple program on your computer (although most of them can also be solved by careful human logic, coupled with a certain amount of trial and error).

Suggested program listings are given at the back, but you may come up with totally different, but perfectly valid, ones. The suggested programs are written in standard Basic and should run on most micros.

Tackling some of these will give you an insight into practical programming, and also may introduce you to some of the shortcomings of the micro! For instance, did you know that some micros place an extra character at the front of a string formed using the STR$ command? If yours is one of these, the line:

```
X=12345: X$=STR$(X)
```

will produce X$ with a length of 6, the digit 'l' being the second character!

Now, have some fun, tease your brain, and test your micro!

1. MONEY MUDDLE

I have a certain amount of money. If I had as many pounds as I have pence and as many pence as I have pounds, and then spent 70p – I would have twice the amount that I have actually got.

Can you say how much this is?

2. CROSS-NUMBER!

grid

As a change from the more familiar crossword, here is a crossnumber puzzle. All that you have to do is find the values of P, Q and R such that all of the expressions will fit into the grid.

ACROSS

I. Q

3. P – Q

4. Q^2

5. R

DOWN

I. P x Q

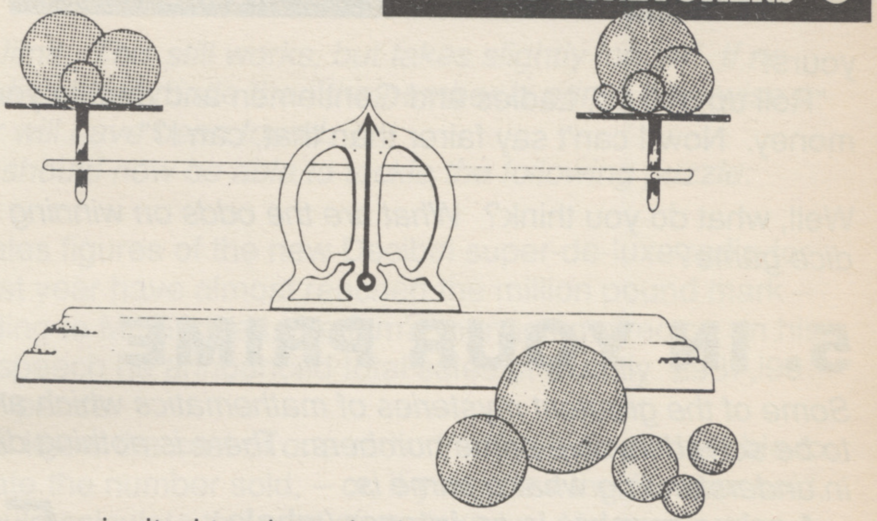
2. P^2

4. P – Q

3. IN THE BALANCE

The Shinybrite Ball Bearing Company manufactures stainless steel ball bearings in all sizes. In the lobby of their showrooms, D Axel, the marketing manager, has set up an interesting display intended to keep visitors amused.

On the display is a regular pair of balancing scales, plus twelve of the firm's ball bearings with diameters ranging from I to 12 centimeters, in regular one centimeter steps.



Visitors are invited to place the ball bearings – six on each pan – so that a perfect balance is obtained.

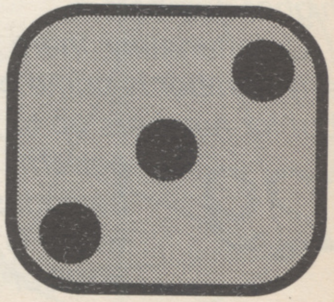
How would you divide the bearings into two groups of six, each group having the same total weight?

In how many other ways can you divide them if the restriction of having groups of six is removed?

4. DICEY BUSINESS

"Roll up, roll up, Ladies and Gentlemen, for the fairest game around!! Now's your chance to double your money!

"Here in front of you, you see six ordinary dice – not loaded, no hidden magnets – in fact, just the same ones that your old Granny uses to shoot craps at Vegas!



"All you do is throw the six dice. If the *product* of all six divided by the *sum* of those same six, comes to a whole number then you will win, and I will match your stake! No quibble, no argument. If you stake one pound then I will pay out one pound. Place a fiver and a fiver will be yours!"

"Roll up, roll up, Ladies and Gentlemen and double your money. Now I can't say fairer than that, can I?"

Well, what do you think? *What are the odds on winning this dice game?*

5. IN YOUR PRIME

Some of the greatest mysteries of mathematics which are yet to be solved involve prime numbers. There is nothing difficult in understanding what a prime is:

A prime number is an integer (whole number) which is not exactly divisible by any whole number other than itself and l.

59

For instance, 7, ll, l7 and 43 are prime. Non primes (which are called composites) include 9, l5, 49 and l43 – plus all of the even numbers except for number 2. This has the distinction of being the only even prime, – since, by the definition given above, it is only divisible by itself and l.

13

It is sometimes necessary to determine if a given number is prime or composite. Is, for example, 139 prime? And what about 4139 or 40139, or even higher numbers.

7

29

Unfortunately, there is no easy test to determine if any number is prime or not, except by trial division, but for numbers up to, say, a few million, the micro can quickly perform such a test. Simply divide the number being tested by all primes from 2 up to the prime which is less than or equal to the square of the number under test. A slightly easier test (from programming points of view) is to perform the trial division by 2, and then by all **odd** *numbers from 3 to the upper limit. This still works, but takes slightly longer! If no exact division is made then the number is prime otherwise a divisor will have been found.*

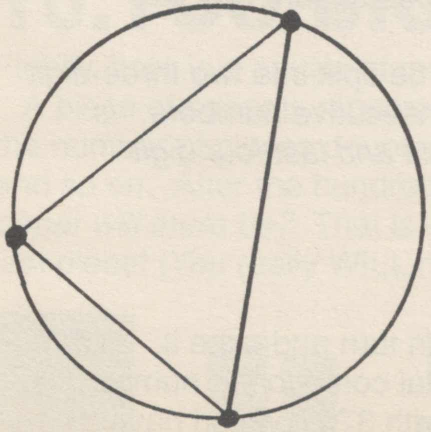
You should now be able to tackle the following puzzle:

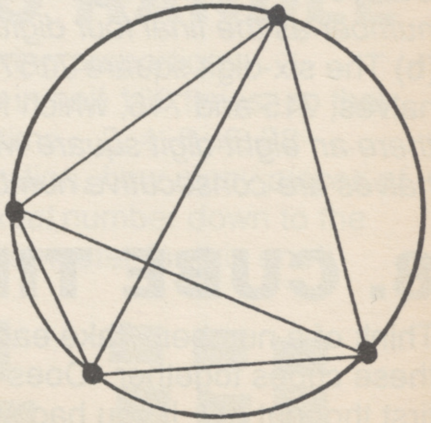
The sales figures of the new Decibel super-de-luxe radio for the past year have almost reached the million pound mark – according to Mr Gudgett, the firm's managing director. In his anual speech he announced total sales of exactly £937,l90 and 57 pence.

If you knew the cost of one radio then you would be able to calculate the number sold, – or, if you knew the number sold, you could calculate the cost of each radio. However, you should be able to work out both figures given the information that the total number of pence in the price of one radio is greater than the number of radios sold.

What is the cost of each radio and how many were sold?

6. THINKING IN CIRCLES





Jamie and his sister Jill were drawing patterns. Jamie placed three dots around the circumference of a circle and joined every dot with every other dot. Jill did the same, except that she placed four dots on the circumference. When they counted up the lines, they found that Jill had drawn six lines to Jamie's three.

This set Jamie wondering if there were any other similar pairs of patterns, one having double the number of lines of the other. He soon found that fifteen dots would need l05 lines to connect them, while twenty-one dots would need 210 lines. A third pair were the 3570 lines connecting 85 dots, and 7140 lines connecting 120 dots.

At this point his calculations came to an abrupt end.

Can you find the next highest pair of patterns with this curious property?

7. SQUARE NUMBERS

The next three problems involve squares, and cubes. First of all here are a couple of quickies!

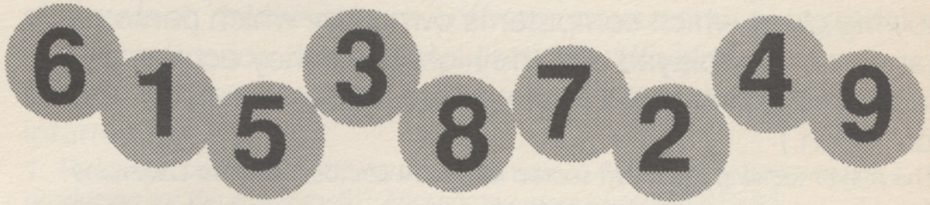
(a) When the number 625 is squared the result, 390625, ends with the same three digits that form the original number. *Can you find a four-digit number whose square has the number as the final four digits?*

(b) The six-digit square 715716 can be split into two three-digit halves, 715 and 716, which form consecutive numbers. *Is there an eight-digit square whose first and last four digit halves are consecutive numbers?*

8. CUBE TIME

Think of a number. Take each digit in turn and cube it. Add these cubes together. Does your total come to the number you first thought of? If you had started with 370 it would have. *How many other numbers can you find?*

9. SHUFFLED COUNTERS



Here are nine counters bearing the numbers I-9. They have been arranged to represent the number 615387249, which has the curious distinction of being a perfect square $(24807)^2$ and also containing each of the digits (excluding zero) once only.

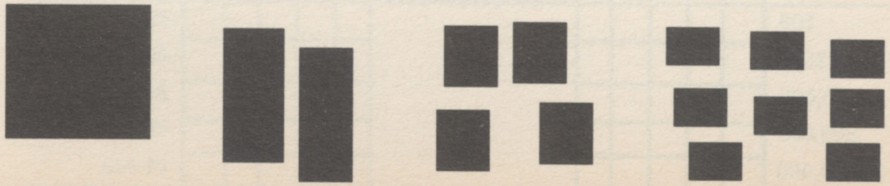
Can you re-arrange them to form: (a) the highest square possible (b) the lowest?

When you have done this try to find *the lowest and highest primes* using the same nine digits (see puzzle five).

10.TOO BIG TO HANDLE

Finally, here is a puzzle of mind-blowing proportions:

A piece of paper is repeatedly torn in half 100 times, so that the number of pieces doubles each time – 2, 4, 8, I6, 32 ...... and so on. After the hundredth operation, *how many pieces of paper will there be?* That is – the *exact* number down to the last piece! (You really WILL need a computer for this one!)



11. ANCIENT HISCORES

Five ageing game players each tackled a classic computer game on a classic computer. Your task is to work out from the following clues which computer is owned by which person, what game they played and the high-score they achieved.
(Place ticks and crosses in the grid to help you build up the information.)

1. The player tackling Pac-Man scored less than 800,000 and the Galaxians high-score was also not the best of the bunch.

2. Andy's computer was the Lynx or the Electron, while Rod did not play Defender, the game running on the Spectrum.

3. Poor Trevor's high-score was only 2,000 – he was put off by Peter playing Frogger. Meanwhile the person playing Invaders managed only 100! (He wasn't using the Lynx).

4. The high-score on the ZX81 was a remarkable 40,000, while Steve on his Vic 20 passed 100,000 within the first five minutes!

	Spectrum	Vic 20	Lynx	Electron	ZX81	100	2000	40,000	800,000	16,000,000	Invaders	Pac-Man	Frogger	Defender	Galaxians
Peter															
Steve															
Rod															
Andy															
Trevor															
Invaders															
Pac-Man															
Frogger															
Defender															
Galaxians															
100															
2000															
40,000															
800,000															
16,000,000															

12. 16-BIT MYSTERY

Five software houses were each planning to release a game on a single 16-bit machine. You have to work out from these clues which machine each software house chose, together with the game's price and release date (all different).
(Place ticks and crosses in the grid to help you build up the information.)

1. The game costing £14.95 was from Ocean or Activision (Activision were producing for the Macintosh). Microprose were charging £12.95.

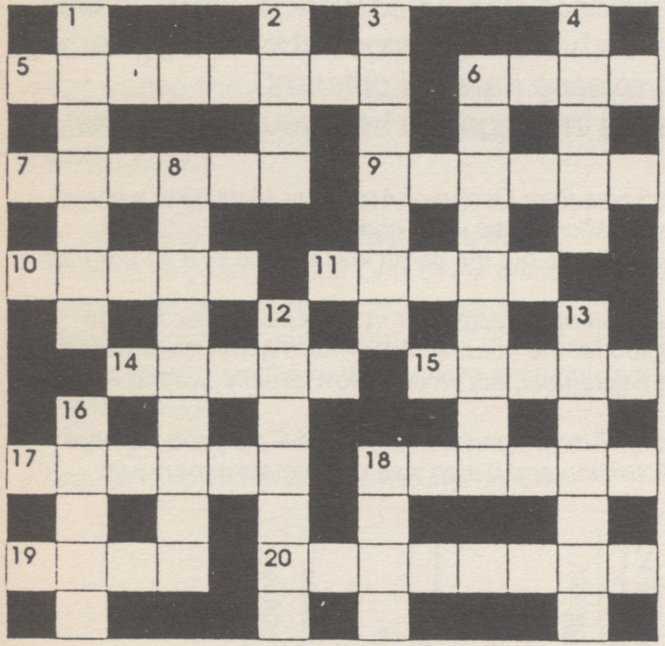
2. Ocean's release date was March, but the game was not the £19.95 program coming out on the Amiga.

3. The Amstrad PC title was due out exactly four months before the £24.95 program which was scheduled for the autumn. Activision's game meanwhile was definitely not for release in September, but would follow exactly two months after the £9.95 title.

4. Firebird's programwas on ST or Amiga (certainly, the ST program was not from Ocean, US Gold or Activision and it also wasn't the most expensive).

	Atari ST	Amiga	Archimedes	Macintosh	Amstrad PC	£9.95	£12.95	£14.95	£19.95	£24.95	March	May	July	September	November
Ocean															
US Gold															
Activision															
MicroProse															
Firebird															
March															
May															
July															
September															
November															
£9.95															
£12.95															
£14.95															
£19.95															
£24.95															

13. DOUBLE PUZZLE



This puzzle has cryptic clues and straightforward clues but the answers are the same – take your choice.

CRYPTIC

ACROSS

5. Full range of the personal computer (8)
6. Figure Ian out to be a Russian (4)
7. Game of pontoon (6)
9. Sitter upset by game from Mirrorsoft (6)
10. Sees on the way back and pauses (5)
11. Type of instruction that's not for the micro? (5)
14. Data transmitter seen in demo Dempster arranged (5)
15. Entertainment programs to be revealed in the spring, a message says (5)
17. Raced around after a place to play computer games (6)
18. Events arranged for Spielberg first (6)
19. Game giving learner pay-out (4)
20. Carl is in disarray when Clive appears (8)

DOWN

1. Speak about physical exercise as work (7)
2. Let go at no cost (4)
3. Game Ma put back on the computer (7)
4. Fundamental high-level language (5)
6. A recent, if unusual, form of computer connection (9)
8. Tact needed for a game from Leisure Genius (9)
12. Forever seething about setback (7)
13. Seems indifferent to computer game (7)
16. Figure of Scandinavian mythology strolling around (5)
18. Young male youth head of Japanese corporation (4)

STRAIGHTFORWARD

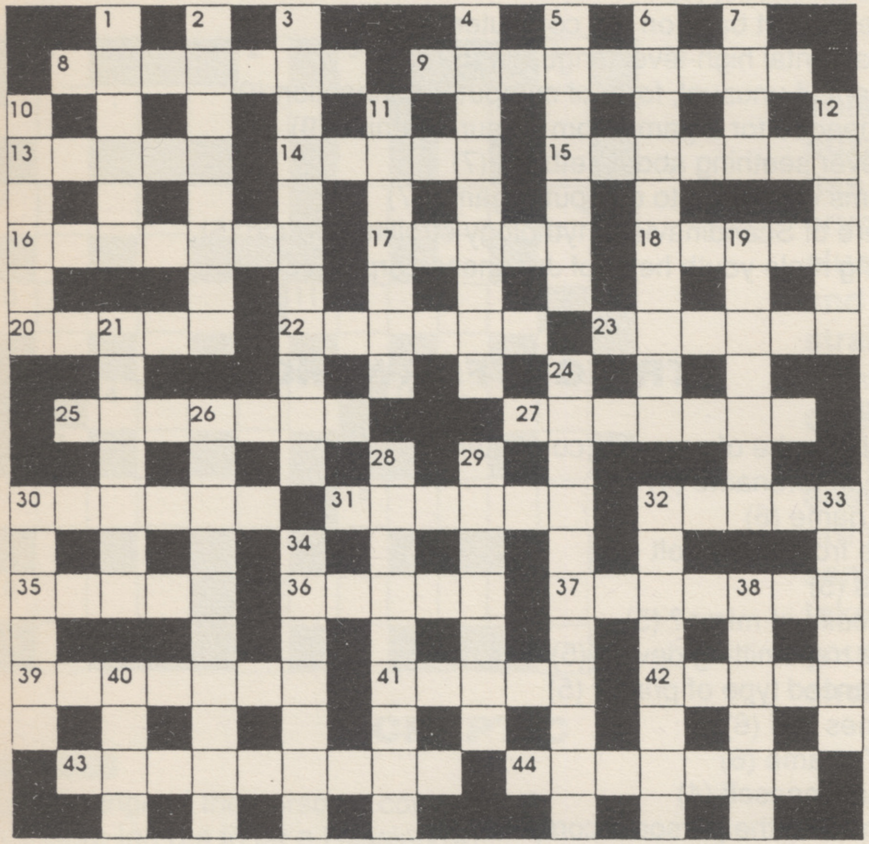
ACROSS

5. Popular make of personal computer (8)
6. Russian forename (4)
7. Card game (6)
9. Game from Mirrorsoft (6)
10. Halts (5)
11. Opposite of micro? (5)
14. Data transmitting device (5)
15. Advanced type of printer (5)
17. Games hall (6)
18. Boy's name (6)
19. Amuse oneself (4)
20. Pioneer of the personal computer (8)

DOWN

1. Work (7)
2. Liberate (4)
3. Alan Sugar's company (7)
4. Beginner's All-purpose Symbolic Instruction Code (5)
6. Computer connection (9)
8. Game from Leisure Genius (9)
12. Go backwards (7)
13. Game from Konami (7)
16. Creature of Scandinavian mythology (5)
18. Japanese electronics manufacturer (4)

14. JUMBO PUZZLE



ACROSS

8. Software house providing *The Trapdoor* (7)
9. Translate (9)
13. Throw away (5)
14. Interference affecting signals (5)
15. Sequences of characters (7)
16. Keep in store (7)
17. Deduce logically (5)
18. Pick-me-up (5)
20. Repeated process in programs (5)

22. 'Number ---,' to process vast calculations (6)
23. Yogi Bear companion (6)
25. Make a picture move (7)
27. Unit of a computer (7)
30. Up-to-date (6)
31. Game from Mirrorsoft (6)
32. Popular PC language (5)
35. African animal (5)
36. Grieve (5)
37. Great delight (7)
39. Royal castle (7)
41. Coldly detached (5)
42. Pop (5)
43. Muddle (9)
44. Berated (7)

DOWN

1. Optical ones are replacing cables (6)
2. Game from Future Concepts (8)
3. Elite computer game (11)
4. Computer connection (9)
5. '--- Genius,' software house (7)
6. Actions carrying out computer instructions (10)
7. Gas used in lighting (4)
10. Of the stars (6)
11. Least amount (7)
12. Hitchcock horror film (6)
19. Game from Hewson (7)
21. Confessed (5,2)
24. Text processing package (4,7)
26. Software house providing *Dark Castle* (10)
28. E.g. *Chuck Yeager's Advanced Flight Trainer* (9)
29. Desert (7)
30. Red Indian (6)
32. American game (8)
33. Prairie wolf (6)
34. Female ruler (7)
38. Fliers (6)
40. Midday (4)

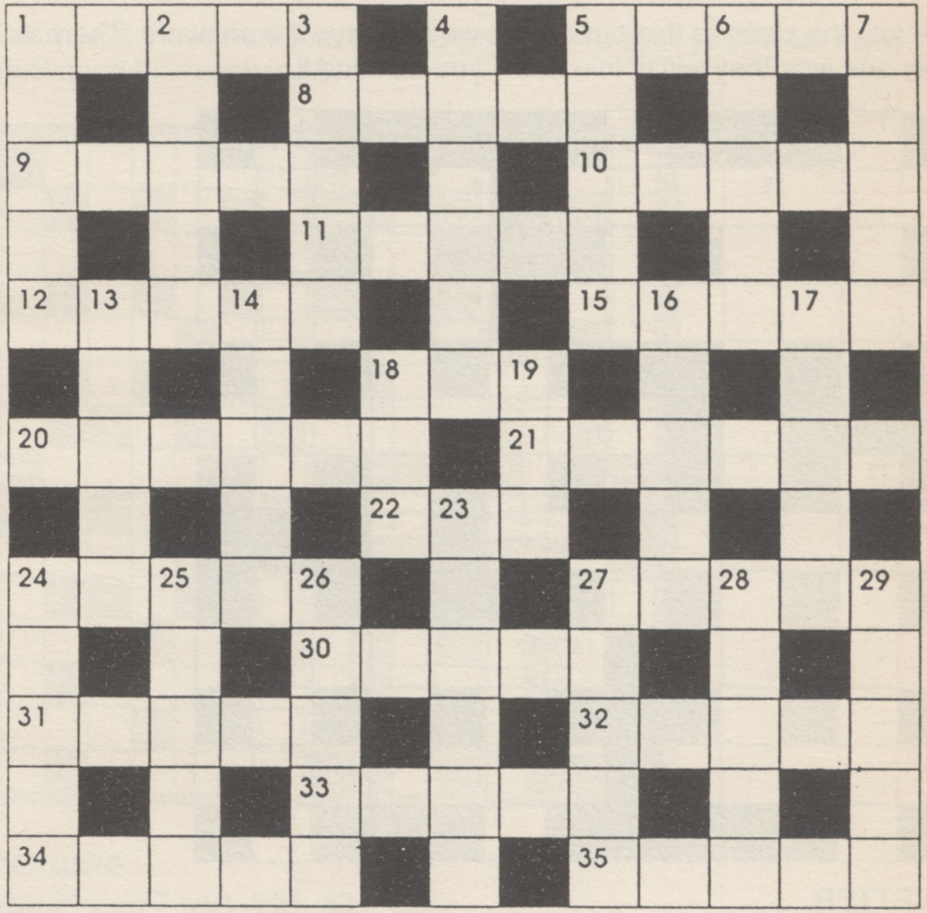
15. CRYPTIC PUZZLE

ACROSS

1. Tiara fashioned by hardware producer (5)
5. Drunk, I'm put inside, being over it, perhaps (5)
8. Sound one is distorting (5)
9. Software house that's all at sea (5)
10. Do I've arranged with a kind of display (5)
11. Game only for the select few? (5)
12. Drain broken at lowest point (5)
15. Type Norma is excited by (5)
18. Network you might get caught up in (3)
20. Triumphant cry from Archimedes (6)
21. In pure form not quite ready (6)
22. Dragging out an old cloth (3)
24. Charged, you could be put in them (5)
27. The doorman's one to handle the hothead inside (5)
30. Breaks into system of journalists (5)
31. Is to take action against publication (5)
32. Wipe out some of Vera's educational software (5)
33. Dread reprogramming the computer (5)
34. Caused by a bug some terrorist inserted (5)
35. Is set to travel round locations of computer installations (5)

DOWN

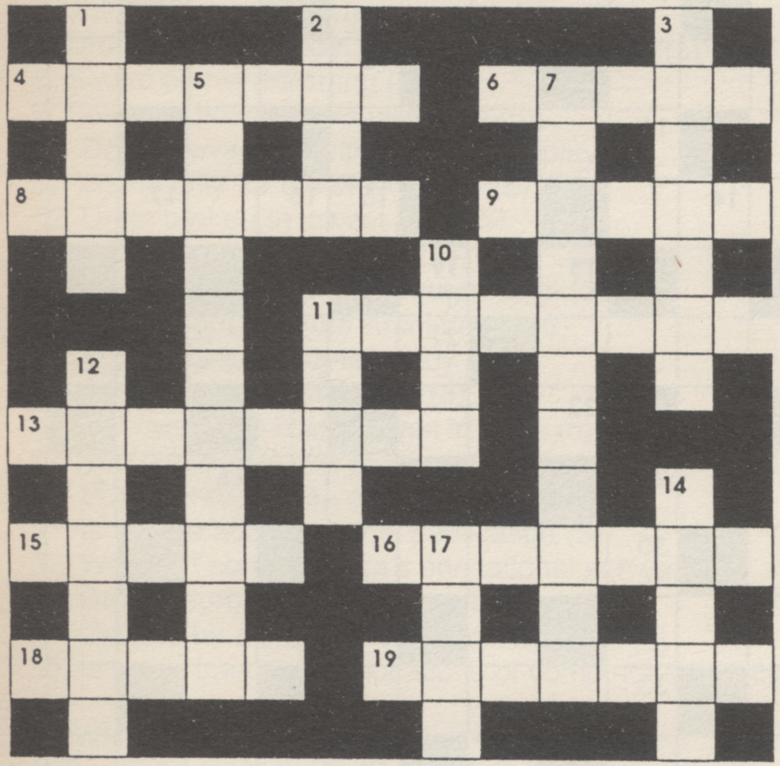
1. Computer making one a little footsore? (5)
2. Change a program for twelve noon (5)
3. Bullring (5)
4. Share out after Vi died accidentally (6)
5. Make merry back at the bar (5)
6. Ed and Mom developed means of transmitting date (5)
7. Rose may have one joining EMI company (5)
13. Entertain Sue and Ma dancing (5)
14. First input to trade gives perfect output (5)
16. Giants from Origin Systems (5)
17. The fruit of the PC industry (5)
18. Prolonged struggle in field of new artificial intelligence (3)



19. Virus disrupting computer programs (3)
23. A car Ed crashed into building housing games machines (6)
24. A first for Sinclair (5)
25. Earl's developed a modern type of printer (5)
26. Cut from the share out (5)
27. New ruses by people programs are written for (5)
28. He goes to the skill-centre (5)
29. Staggers, holding the tapes (5)

16. CLUELESS PUZZLE

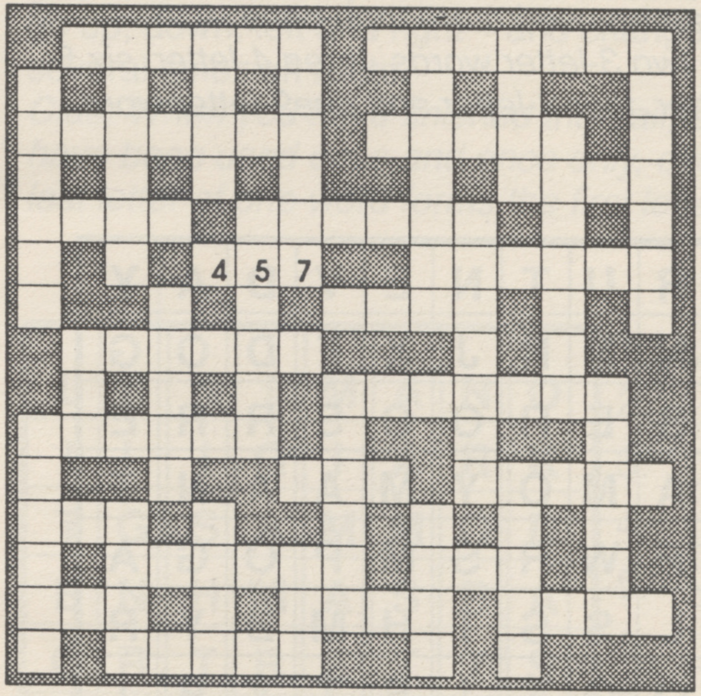
We lost the clues to this puzzle but we still have the answers. There is only one way they will fit in – see if you can find it.



4-LETTER
AMMO ANTI GUNS MINI
5-LETTER
ALGOL ANGLE BASIC ELITE ERROR SPOOL
7-LETTER
AMSTRAD ANDROID BOOLEAN COMPILE PROTONS TOOLKIT
8-LETTER
COMMANDO GAMEPLAY
11-LETTER
LINEPRINTER TELECOMSOFT

17. NUMBER PUZZLE

Can you fit these numbers into the pattern? To start you off we have positioned the number 457.



3-FIGURE
205 214 457 591 601 834 921
4-FIGURE
1223 1682 2439 3010 4144 4216 6068 6091 7105 8180
5-FIGURE
34862 35579 62914 89043 93462
6-FIGURE
186910 214321 373681 556843 578864 598199 654316 689177
810403 838461 863461 929480 999216
7-FIGURE
2104321 3740816 4643219 7187169 8986143 9402011 9947684

18. WORD SQUARE

The grid hides 20 words relating to leisure computing. The words run in straight lines, forward, backward, up, down and diagonally. Ring round the words as you find them. Letters can be used more than once.

Clue: there are two 3-letter words, three 4-letter, six 5-letter, four 6-letter, four 8-letter and one9-letter word.

E	R	U	T	N	E	V	D	A	Y
B	N	N	R	J	X	F	D	O	G
V	S	E	R	O	C	S	R	R	E
B	A	M	O	Y	M	A	A	N	T
B	F	W	R	S	M	P	O	G	A
R	L	S	S	T	H	M	B	Y	R
R	Q	O	S	I	E	T	Y	B	T
E	P	H	C	C	N	R	E	M	S
Y	O	S	R	K	O	E	K	O	P
A	X	Z	E	M	Y	Q	T	U	T
L	E	V	E	L	D	B	I	S	F
P	R	M	N	Z	A	L	I	E	N

19. SOFTWARE TRAIL

Starting with the emboldened 'M', you must follow a trail of 10 software and hardware companies through this grid. It's not as easy as it sound, because each word can go up, down, left and right – and change direction several times en route.

Clue: When you have finished the trail, every letter will have been used once and once only, except that the last letter of one word forms the first letter of the next.

L	E	N	I	M	A	N	O
I	L	I	G	I	A	R	K
T	G	S	A	M	M	O	D
E	N	H	**M**	A	S	R	A
O	R	T	R	E	T	T	S
N	I	S	T	A	T	A	M
O	C	A	E	G	I	L	L
D	E	M	R	S	E	G	A

1. ______________
2. ______________
3. ______________
4. ______________
5. ______________
6. ______________
7. ______________
8. ______________
9. ______________
10. ______________

20. CLASSIC TRIVIA

15 questions for computer games players whose memories go back a few years.

1. What was the early game by Elite intended as a *Jet Set Willy* beater?
a) *Blue Thunder* **b)** *Kokotoni Wilf* **c)** *Frank Bruno's Boxing*

2. Which of the following is odd one out?
a) Jetpac **b)** Lunar Jetman **c)** Pssst! **d)** Zip Zap **e)** Cookie

3. What was classic shoot-em-up in which the controls were rotate left and right, thrust and fire?
a) *Space Invaders* **b)** *Asteroids* **c)** *Galaxians* **d)** *Defender*

4. Which of these is the odd one out?
a) Dragon **b)** Lynx **c)** Rhinocerous

5. Which of these is NOT a game by Jeff Minter?
a) *Intergalactic Llamas Battle on the Edge of Time* **a)** *Revenge of the Mutant Camels* **c)** *Assault of the Sex-Crazed Sheepoids*

6. What was the game in which you had to dodge barrels being rolled down ladders at you by a vicious animal.?
a) *Donkey King* **b)** *Kinkey Dong* **c)** *Donkey Kong* **d)** *Revenge of the Mutant Barrels*

7. Which of the following was not a version of *Skramble*?
a) *Chuckie Egg* **b)** *Rocket Raid* **c)** *Penetrator* **d)** *Caverns of War*

8. Which classic software house put out the original version of the 1983 smash hit *Manic Miner*?

a) Bug-Byte **b)** Software Projects **c)** Quicksilva **d)** Romik

9. Who was the programmer of *Blagger, Suicide Express* and *Potty Pigeon*?
a) Matthew Smith **b)** Eugene Evans **c)** Tony Crowther **d)** Pete Connor

10. Which program was awarded Game-of-the-year for 1983?
a) *Jet Set Willy* from Software Projects **b)** *Valhalla* from Legend **c)** *The Hobbit* from Melbourne House **d)** *Owzat* from Virgin

11. Which classic arcade game involved sliding blocks of ice?
a) *Ice-breaker* **b)** *Skate Rink* **c)** *Revenge of the mutant water molecules* **d)** *Pengo*

12. What is the next game in this series: *Jungle Trouble, Harrier Attack, Scuba Dive*
a) *Storm Warrior* **b)** *Combat Lynx* **c)** *Lords of Midnight*

13. On what machine did Zalaga and Frak! from Aardvark first appear?
a) Enterprise **b)** BBC **c)** Video Genie **d)** Oric

14. Which company spent a fortune in developing two 'megagames' before going bust?
a) Softek **b)** Fantasy **c)** Imagine **d)** Romik

15. Which company spent almost a year hyping a space game which turned out to be written largely in Basic?
a) Legend **b)** Imagine **c)** US Gold **d)** Database

21. PEOPLE TRIVIA

Questions about the personalities in the computer scene.

1. Richard and David Darling run Codemasters, and Jim Darling's an employee of theirs. What relation is he to them?
a) Their younger brother **b)** Their father **c)** None - the common surname's a coincidence **d)** None - he changed his name to match theirs

2. What's Amstrad boss Alan Sugar's middle name?
a) Michael **b)** Martin **c)** Maurice **d)** David

3. Who made headlines with a fight in a Cambridge pub?
a) Frank Bruno and Mike Tyson **b)** The Darling brothers **c)** Clive Sinclair and Chris Curry **d)** Joe Mackeson and Frank Stout

4. Who programmed *Xenon* for Melbourne House?
a) The Bitplane Brothers **b)** The Blitter Brothers **c)** The Bitmap Brothers **d)** The Doobie Brothers

5. What are programmers Steve Turner and Andrew Braybrook collectively known as?
a) Binary Innovation **b)** Design Design **c)** Graftgold **d)** Probe

6. Who owns the computer game rights to James Dean?
a) US Gold **b)** Ocean **c)** Elite **d)** Mastertronic

7. Who featured on the first screen of Domark's *Split Personalities*?
a) Margaret Thatcher **b)** Ronald Reagan **c)** Jeffrey Archer **d)** Samantha Fox

8. Who endorsed the Arcadia football game *Quarterback*?
a) Gary Lineker **b)** Joe Montana **c)** John Elway **d)** Dan Marino

9. Which one of these quiz show hosts *hasn't* appeared in computer game form?
a) Bruce Forsyth **b)** Bob Holness **c)** Jim Bowen **d)** Bob Monkhouse

10. Which one of these muscle-men has starred in an Ocean game?
a) Arnold Schwarzenegger **b)** Sylvester Stallone **c)** Hulk Hogan **d)** Dolph Lundgren

11. Which rock band's music features on the flip side of Go! game cassettes?
a) Resister **b)** Transister **c)** Transmogron **d)** Capaciter

12. If you're flying an *Advanced Flight Trainer*, who's your instructor?
a) 'Wild Bill' Stealey **b)** Earl Weaver **c)** Skip Williamson **d)** Chuck Yeager

13. Who are Martech digitising for the lead role in *Vixen*?
a) Maria Whittaker **b)** Corinne Russell **c)** Linda Lusardi **d)** Samantha Fox

14. Who endorsed the 'Hand of God' game *Handball Maradona!*?
a) The Pope **b)** Diego Maradona **c)** Gordon Banks **d)** Peter Shilton

15. Which martial arts game did Brian Jacks endorse?
a) *Uchi Mata* **b)** *Yie Ar Kung Fu* **c)** *International Karate* **d)** *Way of the Exploding Fist*

22. GAMES TRIVIA

How much do you know about recent computer titles?

1. Just what are you drilling for in *Driller*?
a) Oil **b)** Gas **c)** Plutonium **d)** Water

2. In *Xor*, chickens run left: what do fish do?
a) Swim right **b)** Float **c)** Fall down **d)** Eat chickens

3. In *Zarch*, what do the aliens spray the landscape with?
a) Pledge **b)** Red virus **c)** Pesticide **d)** Paint

4. What game features dinosaurs who blow bubbles and eat bananas?
a) *The Flintstones* **b)** *Through the Trap Door* **c)** *Rampage* **d)** *Bubble Bobble*

5. In *Arkanoid*, what's a vaus?
a) An extra life capsule **b)** A bonus portal through to the next screen **c)** A head that fires coins at you on the game's final screen **d)** The thing you hit the ball with

6. What kind of creature is Dexter's sidekick Scooter in *Get Dexter*?
a) A cephalopod **b)** A podocephalus **c)** A dufflepud **d)** A gastropod

7. In *ATF* you're armed with Maverick missiles, cannons, and what else?
a) Copperhead missiles **b)** Dully glinting clusters of death **c)** ASRAAM missiles **d)** Smart bombs

8. What was *Quedex* a quest for?
a) Dextrose **b)** Dexter from *Get Dexter* **c)** Dexterity **d)** Dex Dexter from *Dynasty*

9. In Gremlin's *Deflektor*, what gets deflected?
a) A bouncing ball **b)** Bullets **c)** A beam of light **d)** Falling blocks

10. Winston Churchill thought it was the truth; the *Platoon* publicists thought it was innocence. What were they talking about?
a) Richard Nixon's most endearing quality **b)** The first casualty of war **c)** The price of freedom **d)** The prize of peril

11. Which one of these games doesn't really exist?
a) *Ninja Scooter Simulator*
b) *Mr Weems and the She-Vampires*
c) *Invasion of the Transmogrons*
d) *Die, Filth!*

12. Which German government body objected to the violence in Palace's *Barbarian*?
a) The Beerenauslese **b)** The Bundesprufstelle **c)** The Grenzschutze **d)** The Umweltspolitik

13. Which of these is not an *Out Run* tune?
a) Crazy Horses **b)** Splash Wave **c)** Magical Sound Shower **d)** Passing Breeze

14. Which one of these aircraft *can't* you fly in *Flight Simulator II*?
a) A Cessna 182 **b)** A Gates Learjet **c)** A Piper Cherokee **d)** A World War 1 biplane

15. What Ocean game was based on a James Clavell novel?
a) *Shogun* **b)** *Ninja Wally Apocalypse* **c)** *Renegade* **d)** *Tai-Pan*

SOLUTIONS TO MICRO-STRETCHERS

I. MONEY MUDDLE

I had 42.86. The sum obtained by transposing the pounds and pence (86.42), less 70 pence, is equal to twice the original sum (85.72). The program tests all permutations of pounds and pence and prints out the sum which agrees with the statements made. As the amount obtained by switching the pounds and pence results in a higher total the pence value must be greater than the pounds, and this is reflected in second (PENNY) FOR/NEXT loop.

Program listing:

```
10 FOR POUND = 0 TO 99: FOR
PENNY=POUND TO 99
20 X=POUND*100+PENNY:
Y=PENNY*100+POUND
30 IF Y-70=X*2 THEN PRINT
POUND, PENNY
40 NEXT:NEXT
```

2. CROSS-NUMBER

In the crossnumber P=92 Q=58 and R=464

This puzzle depends on checking certain values to determine if specific digits, which occupy the same space on the grid, correspond. By selecting the interlocking values in turn, the running time can be considerably shortened. The initital values of P and Q are set in the two FOR/NEXT loops. The range of these loops is determined since we know that both P and Q have four-digit squares, and must therefore lie in the range 32 to 99. A further reduction can be made since the difference P-Q must be greater than 9 (clue 3A). The value R is a red herring as it plays no part in the puzzle and is formed simply as a consequence of the other values. As each value is computed it is converted into string format to enable the positions of specific digits to be checked. (Computers which introduce a 'ghost' character when performing the STRS function will need to have this removed to restore the digits to their logical order).

Program listing:

```
100 FOR Q=32 TO 89:FOR P=Q+10
TO 99
110 QS=Q*Q:PS=P*P
120
Q$=STR$(Q):P$=STR$(P):QS$=STR
$(QS):PS$=STR$(PS)
130 ID MID$(QS$, 3, 1)<>MID$(PS$,
3,1) THEN 210
150 PQ=P*Q:PQ$=STR$(PQ)
160 IF MID$(QS$,2,1)<>MID$(PQ$,
3,1) THEN 210
170 Z=P-Q:Z$=STR$(Z)
180 IF MID$(Z$, 1,
1)<>MID$(PQ$,2,1)THEN 210
190 IF MID$(Z$,2,1)<>MID$
(PS$,2,1)THEN 210
200 PRINT P, Q
210 NEXT P
220 NEXT Q
```

3. IN THE BALANCE

The scales can be balanced if the ball-bearings with diameters l, 2, 4, 8, 9, and 12 are placed on one pan, the remainder on the other. This is the only solution, even if the restriction of six weights on each pan is removed.

There is no need to compute the actual volume of each of the ball bearings (using Pi) since we are only interested in the ratios of their weights. This will be equivalent to the cubes of their diameters, these values being placed initially in the array W(12). The total weight of all twelve balls is 6084 units, so we are looking for any six with a combined weight of 3042 units. Since the 12 cm diameter ball must be in one group of six, we can take this as a starter (weight 1728) and simply find a further five which total the residue (1314 units). As the 11 cm ball cannot be one of them as it is too large, we need to select five from the remaining ten. There are a number of ways that this can be done, but the program uses a system of ten-bit binary codes. If the ten remaining weights are compared with a ten-bit binary sequence, a '1' indicates that a weight should be added to the pan and '0' that it should not. Consequently, every permutation from 0000000000 (decimal 0) to 1111111111 (decminal 1023) can be assessed. These decimal values are placed in the loop in line l00. The subroutine converts the decimal to its ten-digit binary equivalent. If you are not familiar with this technique, the method should become clear if you study the subroutine. At the same time as this is being done a count (C) is keeping track of the number of '1's in the code. If this does not total 5 (i.e. 5 weights are present), the next decimal value is taken.

If the code is passed, the corresponding weights from the array are totalled up by comparing the binary code with the array. The relevant component of the array is added to the total if there is a'1' at the position in the code. If this total sum equals the target value the binary code is scanned again and the diameters of the required weights are printed out.

To eliminate the restriction of having six weights only, the final statement at the end of the line l00 should be deleted. This will allow all totals to be computed irrespective of the number of '1's in the code.

Program listing:

```
10 DIM W(12)
20 FOR D=1 TO
12:W(D)=D*D*D:NEXT
30 W=1314
100 FOR N=1 TO 1023:GOSUB 1000:
IF C<>5 THEN 200
110 T=0:FOR M=1 TO 10
120 IF MID$ (B$, M, 1)="1" THEN
T=T+W(M)
130 NEXT
140 IF T<>W THEN 200
150 FOR M=1 TO 10
160 IF MID$ (B$,M,1)="1" THEN
PRINT M; " ";
170 NEXT: PRINT
200 NEXT N
210 END
1000 REM BINARY CONVERSION
1010 B$="": R=N:C=0
1020 IF R=0 THEN 1050
1030 R=R/2:IF R=INT(R) THEN
B$="0"+B$ ELSE
B$="'1"+B$:R=INT(R):C=C+1
1040 GOTO 1020
1050 IF LEN(B$)<10 THEN
```

```
B$="0"+B$:GOTO 1050
1060 RETURN
```

4. DICEY BUSINESS

With six dice there are 46656 different throws which can be permutated. Of these, 11393 are winners, which represents a probability of success of 0.4095. That is, you would win approximately 41% of the throws, so over a period of time you must expect to lose on any bets placed. The program simply test all possible throws and totals up the winning and losing scores. Why not try an actual experiment using dice and see how your score compares with the computer?

Program listing:

```
10 WIN=0:LOSE=0
20 FOR A=1 TO 6
30 FOR B=1 TO 6
40 FOR C=1 TO 6
50 FOR D=1 TO 6
60 FOR E=1 TO 6
70 FOR F=1 TO 6
80
S=A+B+C+D+E+F:P=A*B*C*D*E*F
90 Z=P/S
100 IF Z=INT(Z) THEN WIN=WIN+1
ELSE LOSE=LOSE+1
110
NEXT:NEXT:NEXT:NEXT:NEXT:NEXT
120 PRINT  "WINS:";WIN: PRINT
"LOSE:";LOSE
130 END
```

5. IN YOUR PRIME

There were sales of 9629 radios at 97.33 each.

The problem relates to finding the factors of 93719057 since this number must be the product of the number of radios sold and the price of each one. The listing given is a particularly useful one for testing a number to determine if is prime, or for finding its factors if it is composite. As it stands, the listing is used by inputting the number to be tested, in the case above, 93719057. However, it could equally well be used as a subroutine (with suitable modification) to test rapidly any series of values. It reveals two factors 9733 and 9629, and from the terms of the question the former must equal the price, in pence, of each item. If 9733 and 9629 are further tested with the program they will each be seen to be prime numbers, so indicating that there are no other possible solutions (that is 93719057) can be factorised in one way only).

Program listing:

```
1000 INPUT"INPUT A NUMBER FOR
TESTING ";N
1010 M=SQR(N)+1:D=0
1020 IF N/2=INT(N/2) THEN
D=2:GOTO 1060
1030 FOR F=3 TO M STEP 2
1040 IF N/F=INT(N/F)THEN D=F:F=M
1050 NEXT F
1060 IF D=0 THEN PRINT"PRIME":
GOTO 1000
1070 PRINT"COMPOSITE:
FACTORS:";D;" ";N/D
```

6. THINKING IN CIRCLES

The next pair of diagrams in the series are those having 493 and 697 dots around the perimeter. These will have respectively 121278 and 242556 connecting lines.

The first problem is to find an expression which will give the number of connecting lines for any given number of dots. If there are no dots, each one will be joined to n-1 other dots. So, for all the dots there will be n(n-1) lines. But, this number has to be halved as the lines joining any pair of dots run in both directions – i.e. the line from dot 'A' to dot 'B' is identical with the one from dot 'B' to dot 'A'. The program computes the number of lines for successive orders of dots, doubles this number, and then determines if this new number can represent a vlue in the series. Sets of figures which match are printed out.

Program listing:

```
10 N=3
20 T1=N*(N-1)
30 M=INT (SQR(T1*2))
40 T2=M*(M-1)/2
50 IF T1=T2 THEN PRINT N, M
60 IF T1>T2 THEN M=M+1:GOTO 40
70 N=N+1:GOTO 20
```

7. SQUARE NUMBERS

a) 9376 squared equals 87909376

Program listing:

```
10 FOR N=1000 TO 9999
20 S=N*N: S$=STR$(S)
30 V=VAL (RIGHT$(S$,4))
40 IF V=N THEN PRINT N;" ";S$
50 NEXT
```

b) 7810 squared equals 60996100

Program listing:

```
10 FOR N=3163 TO 9999
20 S=N*N:S$-STR$(S)
30 V=VAL (LEFT$(S$,4)):W=VAL
(RIGHT$(S$,4))
40 IF W-V=1 THEN PRINT N; " ";S$
50 NEXT
```

Both of these programs work by squaring a four-digit number and then testing the product to determine if specific values are found. In the second of the two problems, the range for testing can be reduced to 3163 – 9999 as the product must have eight digits.

8. CUBE TIME

Excluding the trivial case of 1, there are four values with the required property: 153, 370, 371, and 407. That is, each of thee is equal to the sum of the cubes of their digits.

The program runs a test for all values from 1 upwards, checking each for its 'sum of the cubes of its digits'.

Program listing:

```
10 N=1
20 N$=STR$(N):T=0
30 FOR F=1 TO LEN (N$)
40 V=VAL (MID$(N$, F, 1))
50 V=V*V*V
60 T=T+V
70 NEXT
80 IF T=N THEN PRINT N
90 N=N+1:GOTO 20
```

9. SHUFFLED COUNTERS

The highest square is 923187456 (30384 squared)
and the lowest is 139854276 (11826

squared)

Of the 362880 different arrangements possible with the nine counters, none of them are prime numbers!

Nine-digit squares in the range 123456789 to 987654321 are generated by squaring numbers in the range 11111 to 31426. The program listed then carries out two tests: 1) to eliminate all squares which contain at least one zero (line 120) and (2) to check that the nine digits are all different. The first of these tests is done using the INSTR function (line 120). Any value for Z at this point other than zero would indicate the presence of a 'O' in the square. Any such squares are rejected. The second test is more complex. The most obvious test would be to check every digit against every other digit in the string – a total of 36 checks for each nine-digit number. The program uses a rougher, but adequate, method. Scanning the string once only it computes the sum and the product of the digits present. Only if the sum is equal to 45 and the product equal to 362880 is the result printed out. These values are the sum and the product of the digits from 1 to 9. The listing as shown will print the required squares in ascending order. To find out the lowest and highest, the program can be stopped after the first result appears and line 100 amended to : 100 for N=31426 to 11111 step 1. The first value printed when the program is re-run will be the highest square. There are thirty, nine-digit squares containing all digits from 1 to 9. You may like to try to find them – but remember, the second test described above may let in some 'rogue' values!

Program listing:

```
100 FOR N=11111 TO 31426
110 S=N*N:S$=STR$(S)
120 Z=INSTR(S$,"0"):IF Z<>0 THEN 200
130 S=0:P=1
140 FOR F=1 TO 9:V=VAL(MID$(S$,F,1))
150 S=S+V:P=P*V
160 NEXT F
170 IF S<>45 THEN 200
180 IF P<>362880 THEN 200
190 PRINTN;" ";S$
200 NEXT
```

10. TOO BIG TO HANDLE

After 100 operations there will be 1267650600228229401496703205376 pieces of paper! Each time that the paper is torn the number of pieces doubles, so the final total will be equal to 2 raised to the power 100. Note: the answer 1.26765 E30 is not good enough. The question asked for the *exact* number.

The normal arithmetic capabilities of the micro are relatively limited and the handling of numbers of this magnitude with the complete accuracy is not possible. However, the program uses a technique which overcomes this difficulty, and instructs the computer to perform the task in the exact way that it would be done longhand with a pencil and paper! The actual numbers are stored as strings thus allowing much larger numbers to be handled. Each digit is removed from the string in turn, converted to a numeric variable, and multiplied by two. This process starts at the right-hand (units) end as in conventional multiplication, and a CARRY variable is used 'carry' over any sum in excess of 9. The resulting values are re-converted back to string format and the resulting calculation is built up as string Z$. To check on the progress of the computation each stage is printed out in turn.

To get an idea of the size of this number, if the pieces of paper were piled one on top of another the distance they would reach (assuming a thickness of 500 to the inch) would be over 8,500,000,000,000,000,000,000 miles – roughly equal to the most remote object that has been discovered in the universe!

Program listing:

```
10 T$="1"
20 FOR P=1 TO 100
30 Z$="":CARRY=0
40 FOR F=LEN(T$) TO 1 STEP-1
50 V=VAL (MID$(T$, F, 1))
60 V=V*2+CARRY:CARRY=0
70 IF V>9 THEN V=V-10:CARRY=1
80 Z$=STR$(V)+Z$
90 NEXT F
100 IF CARRY <>0 THEN Z$=STR$(CARRY)+Z$
110 T$=Z$
120 PRINT"POWER:";P
130 PRINT T$:PRINT
140 NEXT P
```

```
THE FULL VALUE OF 2^100 IS:
1267650600228229401496703205376
```

SOLUTIONS TO LOGIC PUZZLES

11. ANCIENT HI-SCORES

Peter : Lynx : 16,000,000 : *Frogger*
Steve : Vic 20 : 800,000 : *Galaxians*
Rod : ZX81 : 40,000 : *PacMan*
Andy : Electron : 100 : *Invaders*
Trevor : Spectrum : 2,000 : *Defender*

12. 16-BIT MYSTERY

Ocean : Archimedes : £14.95 : March
US Gold : Amiga : £19.95 : May
Activision : Macintosh : £24.95 : Nov
Microprose : Ams PC : £24.95 : July
Firebird : Atari ST : £9.95 : Sept

WORD PUZZLE SOLUTIONS

13. DOUBLE PUZZLE

Across: 5. Spectrum, 6. Ivan, 7. bridge, 9. Tetris, 10. steps, 11. macro, 14. modem, 15. games, 17. arcade, 18. Steven, 19. play, 20. Sinclair
Down: 1. operate, 2. free, 3. Amstrad, 4. BASIC, 6. interface, 8. Diplomacy, 12. reverse, 13. Nemesis, 16. troll, 18. Sony

14. JUMBO PUZZLE

Across: 8. Piranha, 9. interpret, 13. scrap, 14. noise, 15. strings, 16. reserve, 17. infer, 18. tonic, 20. loops, 22. crunch, 23. Booboo, 25. animate, 27. console, 30. modern, 31. Sinbad, 32. Basic, 35. hippo, 36. mourn, 37.

ecstasy, 39. Windsor, 41. aloof, 42. burst, 43. confusion, 44. scolded
Down: 1. fibres, 2. Ramparts, 3. Thundercats, 4. interface, 5. Leisure, 6. operations, 7. neon, 10. astral, 11. minimum, 12. Psycho, 19. Nebulus, 21. owned up, 24. Word Perfect, 26. Mirrorsoft, 28. simulator, 29. abandon, 30. Mohawk, 32. baseball, 33. coyote, 34. empress, 38. airmen, 40. noon

15. CRYPTIC PUZZLE

Across: 1: Atari, 5. limit, 8. noise, 9. Ocean, 10. video, 11. Elite, 12. nadir, 15. Roman, 18. web, 20. eureka, 21. unripe, 22. rag, 24. cells, 27. usher, 30. hacks, 31. issue, 32. erase, 33. adder, 34. error, 35. sites
Down: 1. Acorn, 2. amend, 3. inner, 4. divide, 5. lever, 6. modem, 7. thorn, 13. amuse, 14. ideal, 16. ogres, 17. Apple, 18. war, 19. bug, 23. arcade, 24. Clive, 25. laser, 26. shear, 27. users, 28. heart, 29. reels

16. CLUELESS PUZZLE

Across: 4. protons, 6. ALGOL, 8. toolkit, 9. angle, 11. gameplay, 13. commando, 15. spool, 16. Amstrad, 18. Elite, 19. android
Down: 1. error, 2. anti, 3. Boolean, 5. Telecomsoft, 7. line printer, 10. ammo, 11. guns, 12. compile, 13. Basic, 17. mini

17. NUMBER PUZZLE

Across (in order): 654316, 8986143, 7187169, 34862, 8180, 6091, 578864, 457, 863461, 4144, 929480, 9402011, 810403, 591, 93462, 834, 214321, 205, 601, 1682, 7105, 62914

Down (in order): 598199, 3010, 689177, 9947684, 6068, 3740816, 373681, 2104321, 556843, 4643219, 89043, 921, 999216, 186910, 838461, 35579, 4216, 2439, 1223, 214

18. WORD SQUARE

MEMORY ● SCREEN ● KEYBOARD ● MOUSE ● GRAPHICS ● SOUND ● LEVEL ● PLAYER ● ADVENTURE ● STRATEGY ● ALIEN ● ROM ● RAM ● POKE ● MENU ● JOYSTICK ● BLOCKY ● MICRO ● BYTE ● SCORE

19. SOFTWARE TRAIL

MASTERTRONIC ● CODEMASTERS ● SEGA ● ALLIGATA ● AMSTRAD ● DOMARK ● KONAMI ● IMAGINE ● ELITE ● ENGLISH

TRIVIA ANSWERS

20. CLASSIC TRIVIA

1. b **2.** d **3.** b **4.** c (the others are computers) **5.** c **6.** c **7.** a **8.** a **9.** c **10.** b **11.** d **12.** b (Durell release sequence) **13.** b **14.** c **15.** a

21. PEOPLE

1. b **2.** a **3.** c **4.** c **5.** c **6.** a **7.** b **8.** c **9.** d **10.** b **11.** a **12.** d **13.** b **14.** d **15.** a

22. MODERN GAMES

1. b **2.** c **3.** b **4.** d **5.** d **6.** b **7.** c **8.** c **9.** c **10.** b **11.** c **12.** b **13.** a **14.** c **15.** d